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TT-P-641G
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SUPERSEDING
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FEDERAL SPECIFICATION

PRIMER COATING; ZINC DUST-ZINC OXIDE (FOR GALVANIZED SURFACES)

This specification was approved by the Commissioner, Federal Supply Service, General Services Administration, for the use of all Federal agencies.

1. SCOPE AND CLASSIFICATION

1.1 Scope. This specification covers a ready-to-mix or semiprepared primer for on galvanized metal surfaces. The primers covered by this specification are not intended for use on the inside of drinking water tanks.

1.2 Classification.

1.2.1 Types. Zinc dust-zinc oxide primer covered by this specification shall be of the following types, as specified (see 6.2 and 6.3).

Type I - Zinc dust-zinc oxide linseed oil primer.
II - Zinc dust-zinc oxide-phthalic alkyd resin primer.
III - Zinc dust-zinc oxide-phenolic resin primer.

2. APPLICABLE DOCUMENTS

2.1 The following documents, of the issues in effect on date of invitation for bides or request for proposal, form a part of this specification to the extend specified herein.

Federal Specifications:

TT-L-190 - Linseed Oil, Boiled, (For Use in Organic Coatings).
TT-R-266 - Resin, Alkyd; Solutions.
TT-R-271 - Resin, Phenol-Formaldehyde, Para-Phenyl.
TT-T-291 - Thinner; Paint, Volatile Spirits (Petroleum-Spirits).
TT-T-306 - Thinner; Synthetic Resin Enamel.
TT-T-775 - Tung Oil, Raw (China Wood) (For Use in Organic Coating).
PPP-B-601 - Boxes, Wood, Cleated-Plywood
PPP-B-621 - Boxes, Wood, Nailed and Lock Corner.
PPP-B-636 - Boxes, Shipping, Fiberboard.
PPP-B-640 - Boxes, Fiberboard, Corrugated, Triple-Wall.
PPP-C-96 - Cans, Metal, 28 Gage and Lighter.
PPP-F-320 - Fiberboard; Corrugated and Solid, Sheet Stock (Container Grade), and Cut Shapes.

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PPP-P-704 - Pails, Metal; Shipping, Steel, 1 through 12 Gallon.

Federal Standards:

Fed. Std. No. 123 - Marking for Shipment (Civil Agencies).
Fed. Test Method Std. No. 141 - Paint, Varnish, Lacquer, and Related Materials; Methods of Inspection, Sampling, and Testing.

(Activities outside the Federal Government may obtain copies of Federal Specifications, Standards, and Handbooks as outlined under General Information in the Index of Federal Specifications and Standards and at the prices indicated in the Index. The Index, which includes cumulative monthly supplements as issued, is for sale on subscription basis by the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.

(Single copies of this specification and other Federal Specifications required by activities outside the Federal Government for bidding purposes are available without charge form Business Service Centers at the General Services Administration Regional Offices in Boston, New York, Washington, DC, Atlanta, Chicago, Kansas City, MO, Fort Worth, Denver, San Francisco, Los Angeles, and Seattle, WA.

(Federal Government activities may obtain copies of Federal Specifications, Standards, and Handbooks and the Index of Federal Specifications and Standards from established distribution points in their agencies.)

Military Standards:

MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes.
MIL-STD-129 - Marking for Shipment and Storage.

(Copies of Military Specifications and Standards required by suppliers in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

2.2 Other publications. The following documents form a part of this specification to the extent specified herein. Unless a specific issue is identified, the issue in effect on date of invitation for bids or request for proposal shall apply.

American Society for Testing and Materials (ASTM) Standards:

D 79 - Standard Specification for Zinc Oxide.
D 185 - Test for Coarse Particles in Pigments, Pastes, and Paints.
D 520 - Standard Specification for Zinc Dust (Metallic Zinc Powder).
D 562 - Test for Consistency Using the Stormer Viscosimeter.
D 563 - Test for Phthalic Anhydride Content of Alkyd Resins and Resin Solutions.
D 1296 - Test for Residual Odor of Lacquer, Solvents and Diluents.
D 1475 - Test for Density of Paint, Varnish, Lacquer, and Related Products.
D 1542 - Qualitative Tests for Rosin in Varnishes.
D 1639 - Test for Acid Value of Organic Coating Materials.
D 1642 - Tests for Elasticity or Toughness of Varnishes.

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D 1959 - Test for Iodine Value of Drying Oils and Fatty Acids.

(Application for copies should be addressed to the American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.)

National Motor Freight Traffic Association, Inc., Agent:

National Motor Freight Classification.

(Application for copies should be addressed to the American Trucking Associations, Inc., Tariff Order Section, 1616 F Street, N.W., Washington, DC 20036.)

Uniform Classification Committee, Agent:

Uniform Freight Classification

(Application for copies should be addressed to the Uniform Classification Committee, Room 1106, 222 South Riverside Plaza, Chicago, IL 60606.)

3. REQUIREMENTS

3.1 General. The primer ingredients shall be furnished in two separate containers; one consisting of a liquid (zinc oxide-vehicle) and the other of zinc dust which is to be added to the zinc oxide-vehicle just prior to use. When the entire amount of zinc dust from one container is mixed with all of the zinc oxide-vehicle from another container, as described in 4.3.1, a primer, conforming to all requirements of this specification, shall result.

3.2 Color. The primer shall be of a gray color characteristic of the composition, unless otherwise specified by the buyer. If other colors are desired (reds, greens, buffs, etc.), the following coloring materials or any combination of them in amounts necessary to produce the required color primer will be permitted up to a maximum of 10 percent based on the total pigment to replace an equal weight of the zinc oxide:

Iron oxide (at least 80 percent Fe 203)
Chrome green (c.p.)
Chromium oxide green (c.p.)
Chrome yellow (c.p.)
Burnt umber
Zinc chromate yellow

The buyer may specify from the above list any specific coloring materials that shall be used in producing the desired primer. The color, when specified, shall match a sample mutually agreed upon by the buyer and seller, when tested as specified in table V.

3.3 Condition of zinc oxide-vehicle in container. The zinc oxide-vehicle shall be thoroughly mixed and ground. It shall not be settle, caked, or thickened to such a degree that it cannot be redispersed easily with a paddle to its original condition. It shall be readily incorporated with the zinc dust to form a primer of good brushing consistency when tested as specified in table V.

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3.4 Pigment. The pigment composition in the mixed primer (except when colors other than gray are specified, see 3.2) shall be in accordance with table I (see 6.7).

TABLE I. Pigment

Ingredients	Percent by weight Minimum	Maximum
Zinc dust (ASTM D 520, Type I).....	79	89
Zinc oxide (ASTM D 79, American Process Lead Free)....	19	21

3.4.1 Upon analysis, the zinc dust shall show not less than 94 percent metallic zinc by weight. The pigment, extracted from the zinc oxide-vehicle and ignited, shall show on analysis not less than 98 percent zinc oxide by weight. The total pigment (zinc dust plus zinc oxide) in the mixed primer shall contain a minimum of 74 percent metallic zinc and a minimum of 18 percent zinc oxide by weight. The sum of the percentages by weight of metallic zinc and zinc oxide in the total pigment of the mixed primer shall be not less than 97.

3.5 Vehicles.

3.5.1 Type I (zinc dust-zinc oxide-linseed oil primer).

3.5.1.1 Compositions. The vehicle shall consist of the ingredients in table II.

TABLE II. Vehicle

Ingredients*	Percent by weight Minimum	Maximum
Raw linseed oil.....	89	91
Thinner and drier.....	9	11

*Antiskinning agents may be present.

3.5.1.1.1 Volatile solvent. The volatile solvent used shall be mineral spirits conforming to TT-T-291, type II or any solvent system complying with the following air pollution regulations by volume when tested as specified in 4.3.6.

a. Aromatic compounds with eight or more carbon atoms except ethylbenzene: 8 percent maximum.
b. Ethylbenzene and toluene: 20 percent maximum.
c. Solvents with an olefinic or cyclo-olefinic type of unsaturation: negative test.
d. Ketones: negative test.
e. Total of a & b: 20 percent maximum.

3.5.1.1.2 Nonvolatile. The vehicle shall contain not less than 89 percent, nor more than 91 percent, nonvolatile matter by weight when tested as specified in table V.

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3.5.1.2 Acid number. The acid number of the combined vehicle shall not exceed 4 when tested as specified in table V.

3.5.1.3 Iodine number (Wijs). The fatty acids prepared from the nonvolatile vehicle of the primer shall have an iodine number of not less than 175 when tested as specified in table V.

3.5.1.4 Unsaponifiable matter. There shall be no unsaponifiable matter present in the fatty acids prepared from the nonvolatile vehicle of the primer when tested as specified in table V.

3.5.2 Type II (Zinc dust-zinc oxide-phthalic alkyd resin primer).

3.5.2.1 Composition. The vehicle shall consist of a long oil, linseed-modified phthalic alkyd resin of the air-drying type, conforming to the requirements of TT-R-266, type II, together with suitable driers. Antiskinning agents and suitable driers may be present.

3.5.2.1.1 Volatile solvent. The volatile solvent used shall be mineral spirits conforming to TT-T-291, type II or any solvent system complying with the air pollution regulations by volume as given in 3.5.1.1.1.

3.5.2.1.2 Nonvolatile. The vehicle shall contain not less than 43 percent nonvolatile matter by weight when tested as specified in table V.

3.5.2.2 Phthalic anhydride. The nonvolatile portion of the vehicle shall contain not less than 23 percent phthalic anhydride by weight when tested as specified in table V.

3.5.2.3 Rosin or rosin derivatives. The vehicle shall contain no rosin or rosin derivatives when tested as specified in table V.

3.5.3 Type III (Zinc dust-zinc oxide-phenolic resin primer).

3.5.3.1 Compositions. The vehicle shall consist of 100 percent phenolic resin spar varnish, suitable for grinding with zinc oxide, and shall have an oil-to-resin ration of approximately 2 to 1 by weight. That is, it shall be 25 gallons in light composed of 25 gallons of vegetable drying oil to 100 pounds of phenol-formaldehyde resin, and driers.

3.5.3.1.1 Resin. The resin shall be 100 percent paraphenyl phenol-formaldehyde resin of the fortifying type, meeting the requirements of TT-R-271.

3.5.3.1.2 Oils. The vegetable oils shall consist of equal parts by volume of tung oil meeting the requirements of TT-T-775 and linseed oil conforming to TT-L-190.

3.5.3.1.3 Volatile solvent. The volatile solvent used shall be any solvent system complying with the air pollution regulations by volume as given in 3.5.1.1.1. Anti-skinning agents may be present.

3.5.3.1.4 Nonvolatile. The vehicle shall contain not less than 50 percent solids by weight when tested as specified in table V.

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3.5.3.2 Rosin - pentaerythritol ester. The vehicle shall pass an 80 percent rosin pentaerythritol ester reduction test when tested as specified in table V.

3.5.3.3 Water resistance. A flow-out film of the vehicle on tinplate, air-dried 48 hours, shall withstand immersion in distilled water for 24 hours at temperature of 20 to 30 deg.C (68 to 86 deg.F) and also (separate panel) 6 hours at 75 +/- 2 deg.C (167 +/- 5 deg.F). It shall show no checking, blistering, or whitening, and only slight dulling when observed 5 minutes after removal from water when tested as specified in table V.

3.6 Mixed primer.

3.6.1 Odor. The odor shall be normal for the volatiles permitted by the specification, when tested as specified in table V.

3.6.2 Miscibility with mineral spirits. The primer shall be completely miscible with mineral spirits conforming to grade II of Tt-T-291, when tested as specified in 4.3.2.

3.6.3 Brushing properties. The primer shall show good brushing and leaving properties, and shall dry with a low gloss (eggshell to semigloss) finish without running, streaking, or sagging, when applied as specified in 4.3.3.

3.6.4 Spraying properties. The primer shall spray satisfactorily in all respects when thinned with no more than one part by volume of mineral spirits conforming to grad II of TT-T-291, to eight parts of the mixed primer when tested as specified in table V.

3.6.5 Flexibility. A film of the primer shall show no cracking when prepared, bent, and examined as specified in 4.3.5.

3.6.7 Skinning. The primer shall not skin within 48 hours at 25 deg.C (77 deg.F) in a three-quarter filled closed container when tested as specified in table V.

3.6.8 Quantitative requirements. The mixed primer shall meet the quantative requirements of table III.

TABLE III. Quantitative requirements of primer

	Type I		Type II		Type III	
Characteristics	Min.	Max.	Min.	Max.	Min.	Max.
Pigment, percent by weight of primer	78	81	62	65	64	67
Water, percent by weight of primer	--	0.1	--	0.1	--	0.1
Coarse particles and skins (residue retained on No. 325 standard sieve), percent by weight of pigment	--	4	--	4	--	4

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Consistency, Krebs-Stormer, shearing rate 200 r.p.m.						
Grams	200	325	125	225	150	275
Equivalent KU	82	98	67	86	72	92
Time to set to touch, hours	--	--	1/2	4	1/2	4
Time to dry, hours	--	18	--	18	--	18
Weight per gallons, pounds	23	--	16	--	16.4	--

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or order, the supplier may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure that supplies and services conform to prescribed requirements.

4.2 Sampling and inspection.

4.2.1 Lot. For the purposes of sampling, a lot of the paint shall consist of a manufacturer’s batch. A batch is defined as the end product of all raw materials mixed, blended, or processed in a single operation.

4.2.2 Sampling for inspection of filled containers. A random sample of filled containers shall be selected in accordance with MIL-STD-105 at inspection level I and acceptable quality level (AQL) 2.5 percent defective to verify compliance with this specification regarding fill, closure, and marking and other requirements not involving tests.

4.2.3 Inspection of containers. Each sample filled container shall be examined for defects of construction of the container and the closure, for evidence of leakage, and for unsatisfactory markings; each filled container shall also be weighed to determine the amount of contents. Any container in the sample having one or more defects or under required fill shall be rejected, and if the number of defective containers in any sample exceeds the acceptance number for the appropriate sampling plan of MIL-STD-105, the lot represented by the sample shall be rejected.

4.2.4 Inspection of preparation for delivery requirements. An inspection shall be made to determine that the packaging, packing,a nd marking comply with the requirements of section 5 of this specification. Defects shall be scored in accordance with table IV. For examination of interior packaging the sample unit shall be one shipping container fully prepared for delivery. Sampling shall be in accordance with MIL-STD-105. Defects of closure listed shall be examined on shipping containers in the end item inspection lot. The inspection level shall be S-2 and the AQL shall be 4.0 defects per hundred units.

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TABLE IV. Classification of preparation for delivery defects

Examine	Defects
Markings (exterior and interior)	Omitted; improper size, location, sequence, or method of application.
Materials	Any component missing or damaged.
Workmanship	Inadequate application of components such as incomplete closure of container flaps, loose strapping, inadequate stapling. Bulging or distortion of container.

4.2.5 Testing of the end item. the methods of testing specified in 4.4 shall be followed. For purposes of sampling, the lot shall be expressed in units of galls of paint. The sample unit for testing shall be one gallon of paint, randomly selected from containers in the lot. The paint shall be placed in separate clean, dry containers, sealed, marked, and forwarded to the testing laboratories. The sample size shall be as follows;

Lot size (gallon)	Sample size
800 or less	2
801 up to and including 22,000	3
22,001 and more	5

Tests shall be performed on a sample unit basis. All test reports shall contain the individual values utilized in expressing the final result. The lot shall be unacceptable if one or more sample unit fails to meet any test requirement specified.

4.3 Test procedures. the primer shall be tested in accordance with the applicable test methods indicated in table V, and as specified hereinafter. Alternate test techniques and equipment may be used, but in case of dispute, the test methods specified here shall prevail. Failure of any sample to pass any test, or noncompliance with the requirements of this specification shall be cause for rejection of the lot represented by the sample. Unless otherwise specified all samples shall be prepared and tested at 23 +/-1 deg.C (73 +/- 2 deg.F) and 40 +/- 5 percent relative humidity.

TABLE V. Index

	Paragraph of this specification giving requirements	Applicable method in Fed. Test Method Std. No. 141	Applicable ASTM Method
Condition in container	3.3	3011	--
Skinning	3.6.7	3021	--
Color	3.2 (1)	4250	--
Spraying properties	3.6.4	4331	--
Odor	3.6.1	----	D1296
Rosin	3.5.2.3, 3.5.3.4 (2)	----	D1542; Sec 4A

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Water resistance	3.5.3.3	5011	--
Weight per gallon	Table III	----	D1475
Percentage of pigment	Table III	4021	--
Nonvolatile vehicle (ordinary centrifuge)	3.5.1.1.2, 3.5.2.1.2, 3.5.3.1.4	4051	--
Drying time	Table III	4061	--
Water	Table III	4081	--
Coarse particles and skins	Table III	----	D185; Sec 6
Rosin pentaerythritol ester reduction	3.5.3.2	----	D1642; Sec A
Consistency	Table III	----	D562
Unsaponifiable matter	3.5.1.4	5041	--
Iodine number	3.5.1.3	----	D1959
Acid number	3.5.1.2	----	D1639
Para-phenyl resin	3.5.3.1.1	5141	--
Phthalic anhydride	3.5.2.2	----	D563

(1) Brush the primer on a clean tim or glass panel and allow to dry for 24 hours.
(2) Make the test on a portion of the nonvolatile vehicle separated as in method 4031 of Fed. Test Method Std. No. 141.

4.3.1 Mixing zinc dust and zinc oxide-vehicle. The net weight of both the zinc dust and the zinc oxide-vehicle shall be obtained on the original package as received. Weigh each package as received, empty the contents into another container, wipe clean and weigh. This weight subtracted form the weight of the original package gives the net weight of the contents. It is not necessary to mix the entire amount of zinc dust and zinc oxide-vehicle received, but the amount mixed shall be in the exact proportion of the new weights obtained. for mixing less than the entire amount, weight the exact proportion of zinc dust and zinc oxide-vehicle, to yield the amount of mixed primer desired, in separate containers. Add a small portion of the zinc oxide-vehicle to the zinc dust and mix to a smooth paste, after which the balance is added and thoroughly mized. Determine compliance with 3.1 before mixing, and retain a small sample of zinc dust and zinc oxide-vehicle in separate, stoppered glass vials for pigment analysis.

4.3.2 Miscibility with mineral spirits. Mix thoroughly one part by volume of mineral spirits, conforming to grade II of II-T-291, with eight parts by volume of the primer by slowly adding the mineral spirits to the primer and stirring constantly. Allow to stand for 24 hours and examine for curdling or precipitation of the vehicle. Settling of the pigment shall be disregarded. Determine compliance with 3.6.2.

4.3.3 Brushing properties. Brush the well-mixed primer on a clean, untreated, galvanized iron panel, 30 by 60 cm (12 by 24 inches). Note whether the primer works satisfactorily under the brush. Place the panel in a nearly vertical position in a well-ventilated room at standard conditions, and allow to dry over-night. The primer shall dry to a smooth film and shall show no running, streaking, or sagging. Determine compliance with 3.6.3.

4.3.4 Flexibility. Apply a film of the primer to a flat, tin panel (method 2012 of Fed. Test Method Std 141) with a 0.051mm (0.002 inch) approximately 0.10mm(0.004-inch) gap clearance) bird film applicator or any other doctor blade with produces a

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film of the same thickness as that produced by the Bird blade. Air dry for 18 hours, at standard conditions, then bake for 24 hours at 105 +/- 10 deg.C (220 +/- 20 deg.F), bend double over a 1/8-inch mandrel, and examine. Determine compliance with 3.6.5.

4.3.5 Adhesion. Brush a coat of the primer on a clean, new galvanized iron panel, 3 by 6 inches air-dry for 19 hours, bake for 3 hours at 121 +/- 3 deg.C (250 +/- 5 deg.F), and cool to room temperature. Test the film with a knife blade. Observe whether the film cuts loose in the form of a ribbon without flaking or otherwise loosening from the panel. Determine compliance with 3.6.6.

4.3.6 Solvent analysis.

4.3.6.1 Separation of volatile portion. Pour about 15 grams of the primer into a 50 ml distilling flask. Add 10 ml of tricresyl phosphate and several anti-bumping stones or Berl saddles. Fit a release valve into the mouth of the flask and attach a delivery tube to the side arm, extending into a receiver. The receiver consists of a test tube (20 x 150 mm) with side arm for attaching to a vacuum pump. The glass delivery tube should reach 38 mm (1-1/2 inch) from the bottom of the tube. Immerse the receiver in a dry ice-acetone bath. Reduce the pressure slowly to 10 mm of mercury. Preheat a silicone oil bath to 180 +/- 1 deg.C (355 +/- 2 deg.F). Raise the oil bath until the oil reaches the sample level. After all solvent has distilled, carefully release the vacuum using the valve that is connected to the distilling flask. Reserve the collected distillate for the aromatic solvent determination and the test for ketone, olefinic and cyclo-olefinic compounds.

4.3.6.2 Determination of aromatic hydrocarbons.

Apparatus: A gas chromatograph equipped with a thermal conductivity detector.

Column Preparation: Two lengths of 6.25 mm of (1/4-inch) stainless steel tubing, 1.83 m (6 ft) and 5.48 m (18 ft) long, are packed with 35 percent N,N-bis (2-cyanoethyl) formamide on 60- to 80-mesh Chromosorb P.

Operating Conditions:

	1.83m	5.48m
Detector cell temperature, deg.C	300	300
Detector cell current, ma	150	150
Injection port temperature, deg.C	300	300
Helium flow at exit, cc/minute	175	110
Column temperature, deg.C	125	70

4.3.6.2.1 Aromatic and oxygenated solvents - procedure A. Install the 1.83 m column and follow the operating conditions described above. Inject about 3 microliters of the isolated distillate and scan the chromatogram. The aliphatic solvents will emerge within 1 minute and the complete chromatogram should develop in about 5 minutes. From the position of the peaks observed on the chromatogram, select an internal standard that will be free of interference, such as cyclopentanol or cyclohexanol. Add 0.6 ml of internal standard to 3 ml of the distillate, analyze according to the above procedure. Peaks emerging after 1 minute are aromatic solvents along with any oxygenated solvents that may be present. Calculate the percent of

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aromatic and oxygenated solvents as follows:

$$\text{Percent aromatic and oxygenated solvents, v/v} = \frac{A \times B}{C \times D}$$

where, A = percent of internal standard added (in this case, 20)
B = area of aromatic and oxygenated solvents.
C = Calibration factor for the internal standard. This factor is dependent on the internal standard used and or the performance of the chromatograph, and should be determined daily.
D = Area of the internal standard (in this case, cyclopentanol or cyclohexanol).

NOTE: If the above determination exceeds 8 percent, continue with the following procedure:

4.3.6.2.2 Total aromatic content - procedure B. Place 5 ml of the distillate in a 10 ml glass stoppered graduate. Add 5 ml of 85 percent sulfuric acid slowly while the graduate is being cooled with tap water. After the acid has been added, shake vigorously for 2 minutes than allow the layers to separate. Remove as much of the top layer as possible and wash with distilled water. Carefully pipet 3 ml of the washed solvent into a small flask followed by 0.6 ml of the internal standard. Mix and analyze according to procedure A. Calculate the percent of aromatic after acid treatment in the same manner as in procedure A and the percent of total aromatic solvents as follows:

$$\text{Percent total aromatic solvents, v/v} = \frac{B \times (100-A)}{100-B}$$

where, A = percent of aromatic and oxygenated solvents from procedure A.
B = percent of aromatic solvents after acid treatment.

NOTE: If the total aromatic content of the solvent is between 8 percent and 20 percent continue with the following procedure:

4.3.6.2.3 Toluene and ethylbenzene - procedure C. Install the 5.48 m column and follow the operating conditions described for that column. Add 0.3 ml of high purity benzene to the 3 ml sample used in procedure A. If the results of procedures A and B indicated the presence of oxygenated solvents, treat this sample with 85 percent sulfuric acid (use 3 ml acid) as described in procedure B. Inject about 3 microliters of sample and allow the chromatograph to develop until all of the xylene isomers appear. Purge that column by raising the column temperature to 120 +/- 1 deg.C (248 +/- 3 deg.F). After the high boiling materials emerge reset the column temperature to 70 +/- 1 deg.C (176 +/- 2 deg.F)C. Calculate the percent of toluene and thylbenzene as follows:

$$\text{Percent toluene, v/v} = \frac{A \times B \times C}{D}$$

$$\text{percent ethylbenzene, v/v} = \frac{E \times B \times C}{D}$$

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where: A = area of the toluene peak
B = calibration factor for the internal standard. This factor is dependent on the internal standard used and on the performance of the chromatograph, and should be determined daily.
C = percentage of internal standard added (in this case, 10)
D = area of the internal standard (in this case, benzene).
E = area of the ethylbenzene peak.

NOTE: Sensitivity of the instrument should be adjusted to keep peaks from running off-scale. Appropriate corrections must be made for changes in sensitivity when computing the peak area.

4.3.6.3 Test for olefinic or cyclo-olefinic compounds. Take 2 test tubes and place 2 drops of the distillate in each. Dissolve the first sample in 1 ml of carbon tetrachloride and add 1 drop of 1 percent bromine in carbon tetrachloride. Shake and allow to sit for 5 minutes. A positive test is indicated by the complete absence of yellow color when observed against a white background. Dissolve the second sample in 1 ml of acetone and add 1 drop of 1 percent permanganate solution (1 gram of potassium permanganate crystals in 95 ml acetone and 5 ml of water). Shake and allow to site for 2 minutes. A positive test is indicated by the decolorization of the purple solution. The solvent is considered to fail the test for olefinic or cyclo-olefinic compounds if either of the above tests is positive (see 3.5.1.1.1).

4.3.6.4 Test for ketones.

4.3.6.4.1 Reagent. Mix carefully 2 grams of 2, 4-dinitrophenylhydrazine, 4 ml of concentrated sulfuric acid, 30 ml of methanol, and 10 ml of water.

4.3.6.4.2 Procedure. Pipet 1 ml of reagent into a small test tube. Add 10 drops of distillate and shake for 30 seconds. A yellow precipitate or cloud in the reagent layer indicates the presence of ketones. Run a blank using one milliliter of reagent and 10 drops of mineral spirits. Check for conformance of solvent composition with 3.5.1.1.1.

5. PREPARATION FOR DELIVERY

5.1 Packaging. Packaging shall be level A, B, or C, as specified (see 6.2).

5.1.1 Level A. The primer ingredients furnished in separate containers (see 3.1.1) shall be packaged as follows:

5.1.1.1 Zinc oxide-vehicle. the zinc oxide-vehicle will be packaged in a con with a 1 gallon capacity conforming to PPP-C-96, type V, class 2, with exterior coating plan B or in a pail with a 5 gallon capacity conforming to PPP-P-704, type III, class 3 or 4 as specified (see 6.2).

5.1.1.2 Zinc dust powder. The zinc dust powder shall be packaged in a can with a 1 gallon capacity conforming to PPP-C-96, type V, class 2 with exterior coating plan B or in a pail with a 5 gallon capacity conforming to PPP-P-704, type II, class 3 or 4 as specified (see 6.2).

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5.1.1.3 Kits. The zinc oxide-vehicle and the zinc dust powder in 1 gallon cans as specified in 5.1.1.1 and 5.1.1.2, shall be packaged in a close-fitting box conforming to PPP-B-636, class weather-resistant. A fiberboard partition shall be provided between the cans with the fiberboard meeting the requirements of PPP-F-320, type CF, class domestic, variety SW, grade 200. The box shall be closed in accordance with the appendix to PPP-B-636.

5.1.2 Level B. The primer ingredients and kits shall be packaged as specified in 5.1.1, except the exterior coating for the cans and pails shall be a commercial coating and the fiberboard box shall be class domestic.

5.1.3 Level C. The primer ingredients and kits shall be packaged to afford protection against damage during shipment form the supplier to the initial destination.

5.2 Packing. Packing shall be level A, B, or C, as specified (see 6.2).

5.2.1 Level A. Unless otherwise specified (see 6.2) the primer kits of the same type shall be packed in a close-fitting box conforming to PPP-B-601, overseas type; PPP-B-621, class 2; PPP-B-636, class weather-resistant; or PPP-B-640, class 2. The box shall be closed and strapped in accordance with the appendix to the applicable box specification. No packing required for the 5 gallon pails.

5.2.2 Level B. Two primer kits of the same type packaged as specified in 5.1 shall be packed in a close-fitting box conforming to PPP-B-636, class domestic. The box shall be closed in accordance with method I of the appendix to PPP-B-636. No packing required for the 5 gallon pails.

5.2.3 Level C. The primer packaged as specified in 5.1, shall be packed to insure carrier acceptance and safe delivery at destination. Containers shall comply with Uniform Freight Classification Rules or National Motor Freight Classification Rules, as applicable.

5.3 Marking.

5.3.1 Civil agencies. The interior packages and shipping containers shall be marked in accordance with Fed. Std. No. 123.

5.3.2 Military agencies. The interior packages and shipping containers shall be marked in accordance with MIL-STD-129.

5.3.3 Special marking and labeling.

5.3.3.1 Cans and pails. Unless otherwise specified (see 6.2), each can and pail, shall be suitably marked or labeled. The markings shall be of a permanent nature, and the labels shall be securely attached so as not to come off the containers. the information shall be shown on the front side of the containers, and shall be as indicated in 5.3.3.2 for the zinc oxide-vehicle container and as indicated in 5.3.3.3 for the zinc dust container.

5.3.3.2 Zinc oxide-vehicle container. Primer, zinc dust oxide (contains zinc oxide-vehicle which shall be added to zinc dust), TT-P-g type, lot number, stock number, date of manufacture, quantity of primer resulting after mixing with zinc dust

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from separate container, information as may be required by Federal and State laws, and manufacturer's name and address.

5.3.3.3 Zinc dust container. Zinc dust (to which the zinc oxide-vehicle is to be added) TT-P-g, type, lot number, stock number, quantity of zinc dust in pounds, and manufacturer's name and address.

5.3.3.4 Directions for use. The directions for use, which shall be clearly legible, shall be shown on the reverse side of the zinc oxide-vehicle container and shall read as follows:

DIRECTIONS FOR USE OF FEDERAL SPECIFICATION TT-P-641G, PRIMER COATINGS: ZINC DUST-ZINC OXIDE (FOR GALVANIZED SURFACES)

"This zinc dust-zinc oxide coating is intended for use as a priming coat on new or old galvanized metal. It is also satisfactory as a finish coat and may be used in one or more coats. One coat hides completely and is adequate for many service conditions on new galvanized iron. Two coats are ample for rusty galvanized surfaces, except under acid or other exposure conditions that normally require special finish coats to protect a reactive type primer. Types I and II primer are recommended for ordinary atmospheric exposure. Type III primer is preferred where severe moisture conditions prevail or where the metal is to be exposed under water. Chemical treatment by phosphoric acid-based or other cleaners before priming with type III primer. Dirt and greasy material shall be removed by cleaning with a solvent, such as turpentine or mineral spirits, before pretreating or painting. This is a semiprepared primer with the zinc oxide mill-ground in the entire vehicle in one container and the zinc dust in a separate container. For mixing, the zinc dust should have a small portion of the zinc oxide-vehicle added to it and mixed to a homogeneous state. The proportions of zinc dust and of zinc oxide-vehicle required for preparing one gallon of ready-to-use primer are approximately as follows:

	Type I	Type II	Type III
Zinc dust, pounds	14.54	7.94	8.50
Zinc oxide-vehicle, pounds	8.76	8.06	8.10

One gallon of mixed primer may be readily prepared by weighing the indicated amount of zinc dust into a gallon-can and then adding the zinc oxide-vehicle until the can is full. The primer may be applied by brushing or spraying. For spraying of types I and II primer, add 1 pint of mineral spirits, TT-T-291, type II, to each gallon of primer. For spraying of type III primer, add 1 pint of thinner TT-T-306, to each gallon of primer. The spreading rate should be approximately 600 square feet per gallon."

"Caution. Keep primer away from flames. Provide adequate ventilation while applying the primer. Avoid prolonged inhalation of vapors. NOT INTENDED FOR USE ON THE INSIDE OF DRINKING WATER TANKS."

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6. NOTES

6.1 Intended use. The intended use is described in the "Directions for Use", specified in 5.3.3.4.

6.2 Ordering data. Purchasers should select the preferred options permitted herein, and include the following information in procurement documents:

(a) Title, number, and date of this specification.
(b) Type of primer coating required (see 1.2.1).
(c) Inspection responsibility, if other than as specified herein; and administrative provisions for inspection records, when applicable.
(d) Size of container required (see 5.1.1.1 and 5.1.1.2).
(e) Selection of applicable level of packaging and packing, and any special marking required (see 5.1, 5.2, and 5.3). When packing is different that specified (see 5.2.1).

6.3 Type I primer is an orthodox linseed oil coating for air drying (not baking). Types II and III cover primer with a synthetic resin vehicle--air-drying or baking--which dry faster than type I primer. Type II primer contains a long oil linseed-modified phthalic alkyd resin vehicle as typified by TT-R-266, type II. Type III primer contains 25-gallon oil length paraphenyl phenolformaldehyde resin vehicle. Types II and III coatings may be baked at temperature up to 200 deg.F.

6.4 No chemical treatment of the galvanized metal is contemplated prior to using types I and II primers for ordinary outdoor exposure, but standard accepted treatments may be used if it seems desirable. For severe moisture conditions or where the metal is to be exposed under water, it is recommended that the galvanized metal be give an chemical treatment before applying type III primer. Phosphoric acid solutions of the zinc phosphate and phosphate-chromate types sold under proprietary brands are among the most satisfactory for this purpose. Dirt and greasy material should be removed by cleaning with a solvent, such as turpentine or mineral spirits, before pretreating or painting.

6.5 While the primary function of zinc dust-zinc oxide primer is to provide adequate adherence to galvanized metal, it is also satisfactory as a finish coat and may be used in one or more coats. One coat hides completely and is adequate for many service conditions on new galvanized iron. Two coats are ample for rusty galvanized surfaces, except under acid or other exposure conditions that normally require special finish coats to protect a reactive-type primer. The primer retains its gray color very well on prolonged exposure to the weather. For finish coats, but not for priming new or only slightly weathered galvanized iron, the primer may be tinted (see 3.2). For example, chrome oxide green gives a soft, pleasing green, which is very durable and shows good color retention.

6.6 Zinc dust-zinc oxide primer should be purchased by volume, the unit being one gallon (equal to 3.785 liters) at 15 deg.C (60 deg.F). Volume is to be determined on the basis of the mixed product. The manufacturer shall furnish the correct proportion of zinc oxide-vehicle in sufficient amount to yield a volume, when mixed, equal to that stated in the purchase order.

6.7 One gallon of zinc dust-zinc oxide primer meeting this specification will have the following characteristics, when the minimum figures are met, and the pigment

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is a mixture of 80 percent zinc dust and 20 percent zinc oxide:

Composition by volume

	Type I	Type II	Type III
	Gallon	Gallon	Gallon
Zinc dust.....	0.2474	0.1350	0.1445
Zinc oxide.....	.0779	.0425	.0455
Total pigment.....	0.3253	0.1775	0.1900
Nonvolatile vehicle.....	.5887	.2940	.3544
Total Solids.....	0.9140	0.4715	0.5444
Volatile (thinner and drier)..	.0860	.5285	.4556
Total primer (gallon).....	1.0000	1.0000	1.0000

Composition by weight

	Type I	Type II	Type III
	Pounds	Pounds	Pounds
Zinc dust.....	14.54	7.94	8.50
Zinc oxide.....	3.63	1.98	2.12
Pigment total.....	18.17	9.92	10.62
Nonvolatile vehicle.....	4.57	2.61	2.99
Total solids.....	22.74	12.53	13.61
Volatile (thinner and drier)..	.56	3.47	2.99
Total primer, weight per gallon	23.30	16.00	16.60

Civil Agency Interest

GSA-FSS
COM-NBS
DOT-FIS
NASA-JFK
GSA-PCD
INT-BPA

Preparing activity:

GSA-FSS

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FEDERAL SPECIFICATION

PRIMER COATING, ZINC DUST-ZINC OXIDE
(FOR GALVANIZED SURFACES)

This amendment, which forms a part of Federal Specification TT-P-641G, dated July 9, 1976, was approved by the Commissioner, Federal Supply Service, General Services Administration, for the use of all Federal agencies.

PAGE 3

Paragraph 3.2 Delete:

Chrome green (c.P.) and Chrome yellow (c.p.)

PAGE 5

Table III. At end of table III, add under characteristics: "Lead, percent nonvolatile"; under minimum for Types I, II and III, add " "; and under maximum for Types I, II and III, add "0.06".

PAGE 10

Add new paragraphs:

4.3.7 Lead content.

4.3.7.1 Sample preparation. Using a 0.0006-inch film applicator and a mechanical applicator plate, duplicate drawdowns for each sample of well-mixed paint shall be made on a standard paint penetration chart and dried for 24 hours. The drawdown shall be at least 10 inches long on the sealed portion of the penetration chart. The drawdown shall be cut into discs of appropriate size to fit the sample holder of a fluorescence X-ray spectrometer.

4.3.7.2 Procedure. Lead content shall be determined using an X-ray fluorescence spectrometer capable of determining lead content at a minimum level of 0.03 percent by weight of the total nonvolatile. The settings for wavelength dispersive fluorescence spectrometer shall be as follows: [1]

Element	Analytical Line	Angle	Crystal	Detection	Collimeter	X-ray tube (NO)
Pb	L	33.93	LiF(200)	Flow S.C.	Fine	60Kv 45Ma
Pb (backgrd 1)		33.00	LiF(200)	Flow S.C.	Fine	60Kv 45Ma
Pb (backgrd II)		35.50	LiF(200)	Flow S.C.	Fine	60Kv 45Ma
Mo	K	20.33	LiF(200)	Flow S.C.	Fine	60Kv 45Ma

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Pulse height selection shall be used in all measurements and counting time shall be 100 seconds. Place the sample disc in the wavelength dispersive unit. Measure the count rates of lead, lead background, and the Molybdenum Compton scattered background form the X-ray tube.

4.3.7.3 Calculation.

$$R = \frac{IPb - Ipb\ (\text{Background I}) + IPb\ (\text{Background II})}{2\ IMo}$$

[1] Energy dispersive fluorescence spectrometers shall be set up according to the manufacturer's manual.

Where I equals gross intensity. These results shall be compared to those obtained with a 0.06 percent lead standard made up from the same type of paint sample and evaluated for compliance with table III.